

Part A

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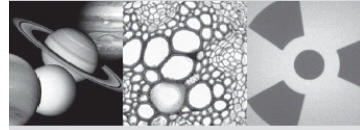
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Overview of the National Yr 6 Science  
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MCEETYA

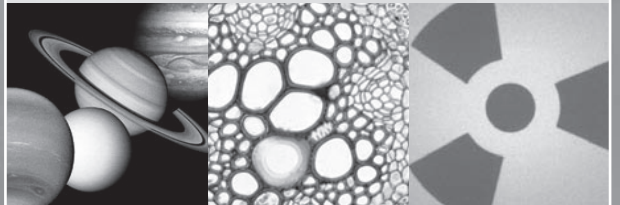


National  
Year 6  
Science  
Literacy  
School  
Assessment

2003

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MCEETYA



National  
Year 6  
Science  
Literacy  
School  
Assessment

2003



Ministerial Council on Education,  
Employment, Training and Youth Affairs

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# Preface

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In 2003, the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) conducted an assessment of a sample of Year 6 students across Australia to assess their proficiency in scientific literacy. The assessment of scientific literacy is part of a national plan that is being put progressively in place to monitor and report on student achievement against the National Goals for Schooling in the Twenty-first Century. The National Goals - and the importance of monitoring student achievement in relation to them were agreed to by all State, Territory and Federal Education Ministers in 1999.

Under the national plan, student performance is being assessed in science, civics and citizenship and information and communication technology (ICT) in three-yearly cycles. The results are being reported against proficiency levels and standards that are established after the first round of testing in each of the three priority areas.

The scientific literacy assessment domain, which defined the scope of the National Science Assessment materials, was developed in consultation with a number of national committees that were established to ensure that the domain was inclusive of the different State and Territory curricula and that the items in the assessments were fair for students, irrespective of where they attended school.

The information and assessment materials in this document have been designed to assist teachers to gauge their own students' proficiency in scientific literacy.

By replicating components of the National Year 6 Science Assessment in the classroom, teachers will be able to compare the results of the classes and individual students with the Year 6 national proficiency levels and standards in scientific literacy.

It is anticipated that teachers will be able to reflect on this information to enhance teaching and monitoring programs in our schools.

# Chapter 1

## Overview of the National Year 6 Science Literacy Assessment

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### Background

In 1999, the State, Territory and Commonwealth Ministers for Education agreed to the Adelaide Declaration on National Goals for Schooling in the Twenty-first Century (MCEETYA, 1999) (<http://www.mceetya.edu.au/nationalgoals/natgoals.htm>).

The National Goals provide the framework for reporting on student achievement through the annual MCEETYA publication, the National Report on Schooling in Australia (ANR).

The Education Ministers also established the National Education Performance Monitoring Taskforce (NEPMT) in 1999 to develop key performance measures to monitor and report on progress toward the achievement of the Goals on a nationally-comparable basis.

They identified eight priority areas for the initial development of performance measures: literacy, numeracy, science, civics and citizenship, information technology, vocational education and training in schools, enterprise education and participation and attainment.

As a first step in early 2000, NEPMT commissioned a project to develop options for the assessment and reporting of the achievements of primary school students in science.

The outcome of this process was a report to the NEPMT entitled *Options for the assessment and reporting of primary students in*

*the key learning area of science to be used for the reporting of nationally comparable outcomes of schooling within the context of the National Goals for Schooling in the Twenty-First Century (Ball et al., 2000).*

The Ball report recommended that students' achievement of scientific literacy (that is, science concepts and science process skills) rather than their acquisition of factual information, be assessed and reported at the primary level. In particular, the report advocated adoption of the definition of scientific literacy used in the OECD's Programme for International Student Assessment (PISA) for the purposes monitoring of primary science.

In July 2001, MCEETYA agreed to the development of assessment instruments and key performance measures for reporting on student skills, knowledge and understandings in primary science. It directed the Performance Measurement and Reporting Taskforce (PMRT), which by then had replaced NEPMT, to undertake the national assessment program. The PMRT commissioned the assessment in July 2001 and the Australian Council for Educational Research (ACER) was the successful tenderer.

The PMRT set the policy objectives and established a steering committee to manage the assessment and a consultative committee to facilitate discussion among the jurisdictions and school sectors. The latter also provided feedback about the appropriateness of the conceptual framework and reviewed the assessment items to ensure that they were inclusive of all the States and Territories' curricula.

The National Year 6 Science Assessment is the first assessment program designed specifically to provide information about performance against the National Goals. MCEETYA has also endorsed similar assessment programs to be conducted for civics and citizenship and ICT.

The intention is that each assessment program will be repeated every three years so that performance can be monitored over time. The first cycle of the program provides the baseline against which future performance will be compared.

Apart from being the first subject area assessment, science is unique because it focuses entirely on primary school performance. The others will assess Year 6 and Year 10 students, but MCEETYA has agreed to use PISA as the measure of performance for secondary science. The Ball report recommended strongly that the assessment of science be conducted at the end of primary schooling because:

*...delay until the end of primary schooling has the advantages of being able to assess a more mature learner who has had greater opportunity to develop scientific skills and processes and develop a better understanding of basic scientific principles.*

(Ball et al., 2000, p.44)

# Implementation of the 2003 National Year 6 Science Assessment

Implementation of the National Assessment involved a large number of separate but related steps, including the development of an assessment domain and items and instruments to assess that domain; the trialling of those items and instruments; the development of key performance measures; the administration of the assessment to a sample of students; and the marking, analysis and reporting of the results.

The report of the National Assessment is available at <http://www.mceetya.edu.au>. It provides details of the school and student samples used, describes the testing process and presents the results at the National, State and Territory levels.

## What did the National Science Assessment measure?

The National Assessment measured scientific literacy. Scientific literacy is a construct that:

*...encompasses the use of broad conceptual understandings of science for making sense of the world, understanding natural phenomena, and interpreting media reports about scientific issues. It also encompasses competencies related to asking investigable questions, conducting investigations, collecting and interpreting data and making decisions.*

(Hackling, 2002, p.1).

This construct has evolved from the definition of scientific literacy used by PISA:

*...the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about that natural world and the changes made to it through human activity.*

(OECD, 1999, p.60)

The science items and instruments therefore assess outcomes that contribute to scientific literacy (such as conceptual understandings) rather than focussing solely on facts. They also assess students' competence in carrying out investigations in realistic situations.

The National Assessment relates to the ability to think scientifically in a world in which science and technology are increasingly shaping children's lives.

An assessment domain was developed in consultation with curriculum experts from each State and Territory and representatives of the Catholic and independent school sectors. This domain includes the definition of scientific literacy and outlines the development of scientific literacy across three main strands.

The domain is available at <http://www.mceetya.edu.au>.

# What aspects of scientific literacy were assessed?

Three strands of scientific literacy were assessed:

- STRAND A: formulating or identifying investigable questions and hypotheses, planning investigations and collecting evidence.
- STRAND B: interpreting evidence and drawing conclusions, critiquing the trustworthiness of evidence and claims made by others, and communicating findings.
- STRAND C: using science understandings for describing and explaining natural phenomena, interpreting reports and making decisions.

A conscious effort was made to develop assessment items that related to everyday contexts rather than to laboratory situations.

The items drew on four concept areas: Life and Living; Earth and Beyond; Natural and Processed Materials; and Energy and Change. These evolved from a review of the National Statements and Profiles and were common across Australian curricula. It is interesting to note that the same concept areas are also used widely in other countries.

Identification of the strands of scientific literacy and the concepts to be assessed by a thorough analysis and mapping of current curriculum documents of all States and Territories. The intention was to ensure that all Year 6 students were familiar with the materials and experiences to be used in the National Science Assessment and so avoid any systematic bias in the instruments being developed.

## Who participated in the National Science assessment?

Approximately 6 per cent of the total Australian Year 6 student population was sampled randomly and assessed. All States and Territories and government, Catholic and independent schools participated. Table 1.1 shows the number of schools and students in the final sample from which performance comparisons were reported.

A grade-based population of students enrolled at schools was chosen. This is consistent with the reporting of literacy and numeracy performance in the ANR. Information about structural differences that may assist interpretation of the results of the testing is summarised in the report of the National Science Literacy Assessment.

**Table 1.1** Number of schools and students in the final sample by State and Territory

State/Territory	Number of Schools in Target Sample	Number and %* of Schools in Final Sample	Number of Students in Final Sample
NSW	122	103 (84%)	2 466
VIC	122	100 (82%)	2 130
QLD	122	110 (90%)	2 607
SA	130	115 (88%)	2 032
WA	126	103 (81%)	2 347
TAS	64	60 (94%)	1 240
NT	32	23 (72%)	496
ACT	44	36 (82%)	854
ALL	762	650 (85%)	14 172

\* 'Percentage of schools' is calculated by dividing the number of schools in the final sample by the number of schools in the target sample for each State and Territory and multiplying by 100.

## How was the National Science Assessment reported?

The National Science Assessment was designed to provide as much information as possible about student performance in scientific Literacy at the Year 6 level. To achieve this, several different test forms were used.

The National Science Literacy School Assessment materials provided here are representative of the items contained in the National Science Assessment.

In order to produce comparable results among students who had completed different tests, statistical analyses were performed and scaled scores generated for all students.

To add meaning to these scores, a panel of curriculum experts and practising teachers developed a set of proficiency standards by reviewing the items and making judgements about the performance expected of students on the assessments.

The standards are described in terms of the understandings and skills that students demonstrated in the National Science Assessment.

These understandings and skills have been mapped against the scientific literacy assessment framework.

Five levels of proficiency in scientific literacy are defined and described and defined in Chapter 8.

The tables produced in Chapters 7 and 8 enable the raw scores achieved by students in the National Science Literacy School Assessment to be converted into equivalent scaled scores and compared with the standards framework developed to report the performance of students in the National Assessment.